Topic: Volume/Surface area of spheres

Question: Find surface area.

What is the surface area of a sphere with a diameter of π cm?

Answer choices:

A $\frac{\pi^2}{2}$ cm^2

B π^3 cm^2

C $2\pi^3$ cm^2

D $\frac{\pi^3}{4}$ cm^2

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Solution: B

If the diameter is π, then the radius is

$$r = \frac{\pi}{2}$$

Use the formula for surface area of a sphere, and plug in the radius.

$$S = 4\pi r^2$$

$$S = 4\pi \left(\frac{\pi}{2}\right)^2$$

$$S = 4\pi \left(\frac{\pi^2}{4}\right)$$

$$S = \pi^3$$

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Topic: Volume/Surface area of spheres

Question: What is the surface area to volume ratio of the solid?

A sphere with radius 6

Answer choices:

A $\frac{1}{1}$

B $\frac{2}{1}$

C $\frac{1}{2}$

D $\frac{1}{4}$

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Solution: C

The surface area of a sphere is given by

$$S = 4\pi r^2$$

Plugging in the radius gives

$$S = 4\pi(6)^2$$

$$S = 144\pi$$

The volume of a sphere is given by

$$V = \frac{4}{3}\pi r^3$$

Plugging in the radius gives

$$V = \frac{4}{3}\pi(6)^3$$

$$V = \frac{4}{3}\pi(216)$$

$$V = 288\pi$$

Therefore, the surface area to volume ratio is

$$\frac{144\pi}{288\pi} = \frac{1}{2}$$

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Topic: Volume/Surface area of spheres

Question: How many gallons?

Water towers are often made in the shape of a sphere high in the air, like a huge lollipop. Most of them are not true spheres, but some are. We'll pretend we have a true sphere with a diameter of 30 ft. How many gallons of water would it hold? (Use π ft$^3 = 24$ gallons.)

Answer choices:

A $54{,}000$ gallons

B $108{,}000$ gallons

C $205{,}000$ gallons

D $234{,}000$ gallons

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Solution: B

The radius of the sphere is 15 ft.

Use the volume formula for a sphere, and plug in the radius.

$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{4}{3}\pi(15)^3$$

$$V = \frac{4}{3}\pi(3{,}375)$$

$$V = 4{,}500\pi \text{ ft}^3$$

Substituting using π ft$^3 = 24$ gallons, we get

$$V = 4{,}500(24)$$

$$V = 108{,}000 \text{ gallons}$$

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